University of Bahrain
College of Information technology
Department of Computer Engineering

Test (1)

Student Name	
I.D. No.	
Section	

Course Title: Digital Logic
Course number: ITCE 202
Semester: 1
Academic Year: 2009/2010
Duration : 1hour
Date: 15th November 2009

Read the following before you start:
1. Write your name, ID and section number
2. Answer all questions.
3. Write your answers on the attached sheets only.

Question	Mark	Mark attained
1	15	
2	15	
3	15	
4	5	
Total	50	

Question [1]: [15 mark]

(a) Convert the following numbers showing all steps. [2 marks each]

$(110)_{10}$ = ( )$_2$

$(673.2)_8$ = ( )$_{16}$

(5)$_{10}$ = ( )$_{7\text{-}3\text{-}2\text{-}2}$

(+17)$_{10}$ = ( )$_{1\text{'s complement}}$

(-32)$_{10}$ = ( )$_{2\text{'s complement}}$

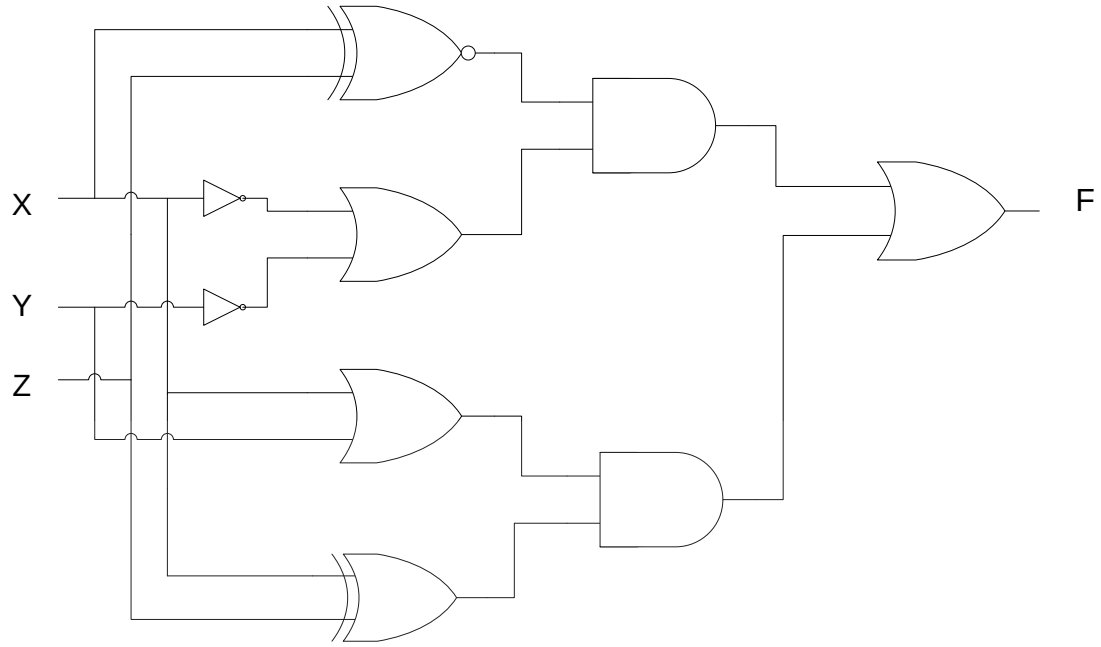
$(33)_4$ = ( )$_{10}$

(b) Add the following numbers in BCD [3 marks]

$(48)_{10}+(52)_{10}=$

Question [2] : [15 marks]

For the circuit shown below:



(a) Find the output expression F

(b) Prove algebraically that the resultant output expression is equal to:

$F=(X \oplus Y)+\overline{Z}$

(c) Express the following in SOP form (apply DeMorgan's Law, do not simplify):

$$F = \left[(A + CD)BD' + C \oplus D\right]'$$

Question [3]: **[15 marks]**

A combinational circuit is divided into two sub-circuits N1 and N2. The input of N1 is a 4bit binary number ABCD, where A is the MSB. The output of N1 is a binary number, XYZ with X being the MSB, whose value equals the number of 1's at the input. The output of N2 represents an excess-3 coded number, MNOP with M being the MSB, whose value equals the binary number received from N1.

a. Determine the truth table for each sub-circuit separately, indicating all don't care conditions.
b. Find the minterm expansion of the output M.
c. Find the Maxterm expansion of the output O
d. Draw the simplest logic circuit for the sub-circuit N2

Question [4]: [5 mark]

Given F= A B' C' + A' B' D + A' C D + B C D

a) Use a K-map to find the minimum Product of Sums for F.

b) Indicate the essential Prime Implicants in your answer and tell why each one is essential underling the minterm.